FIG.1

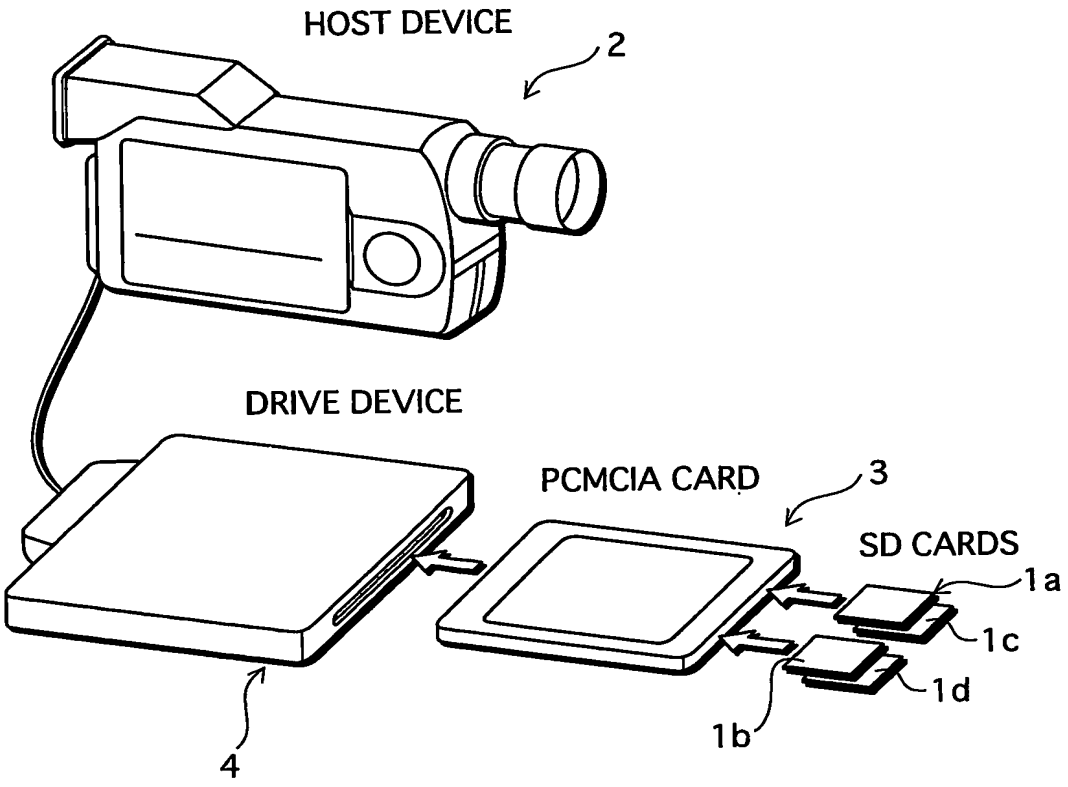


FIG.2

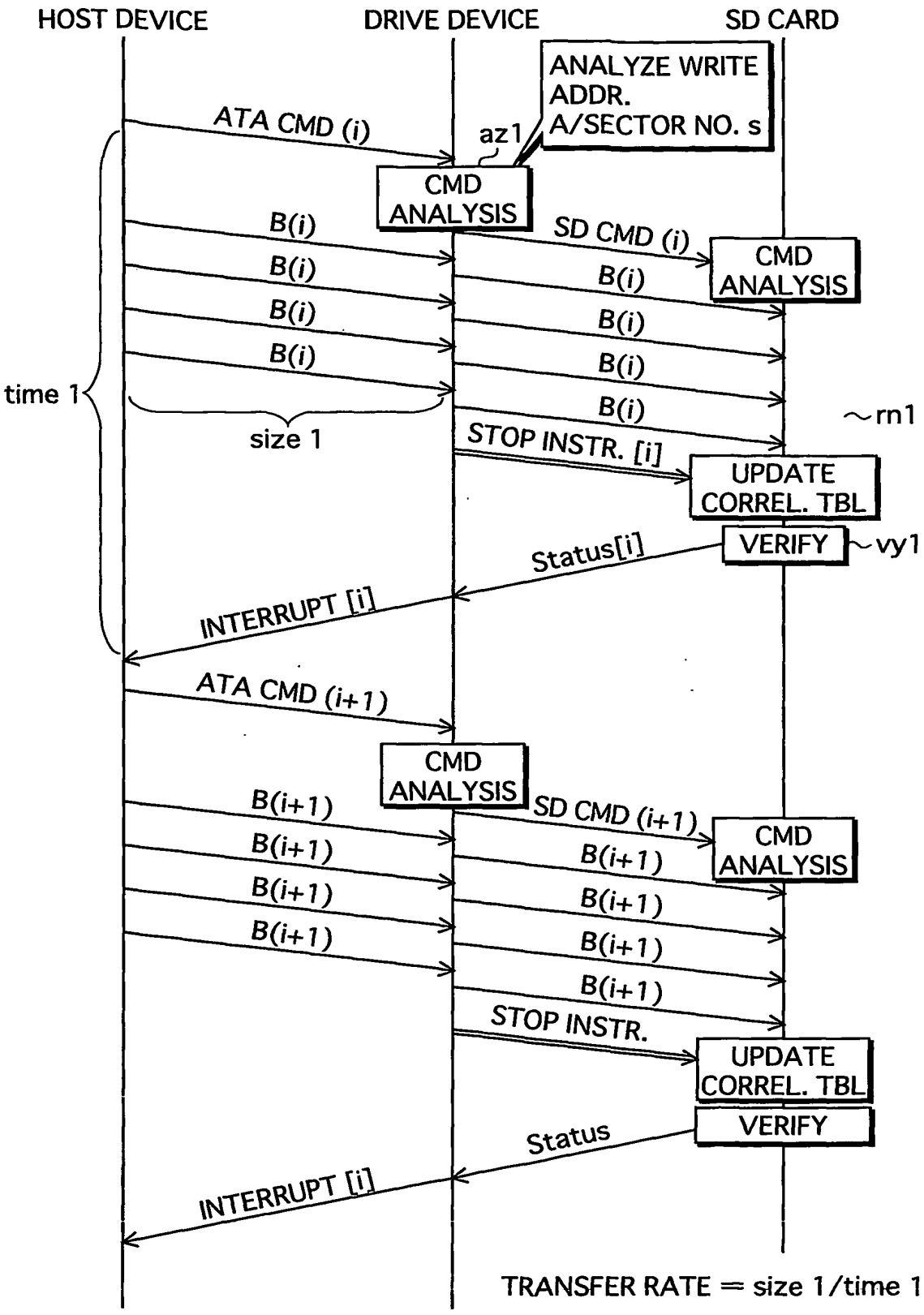

HOST DEVICE
DRIVE DEVICE
SD CARD
ANALYZE WRITE ADDR. A/SECTOR NO. s
ATA CMD (i)
az1
CMD ANALYSIS
B(i)
SD CMD (i)
CMD ANALYSIS
time 1
size 1
~rn1
STOP INSTR. [i]
UPDATE CORREL. TBL
VERIFY
~vy1
Status[i]
INTERRUPT [i]
ATA CMD (i+1)
CMD ANALYSIS
B(i+1)
SD CMD (i+1)
CMD ANALYSIS
STOP INSTR.
UPDATE CORREL. TBL
VERIFY
Status
INTERRUPT [i]
TRANSFER RATE = size 1/time 1

FIG.3

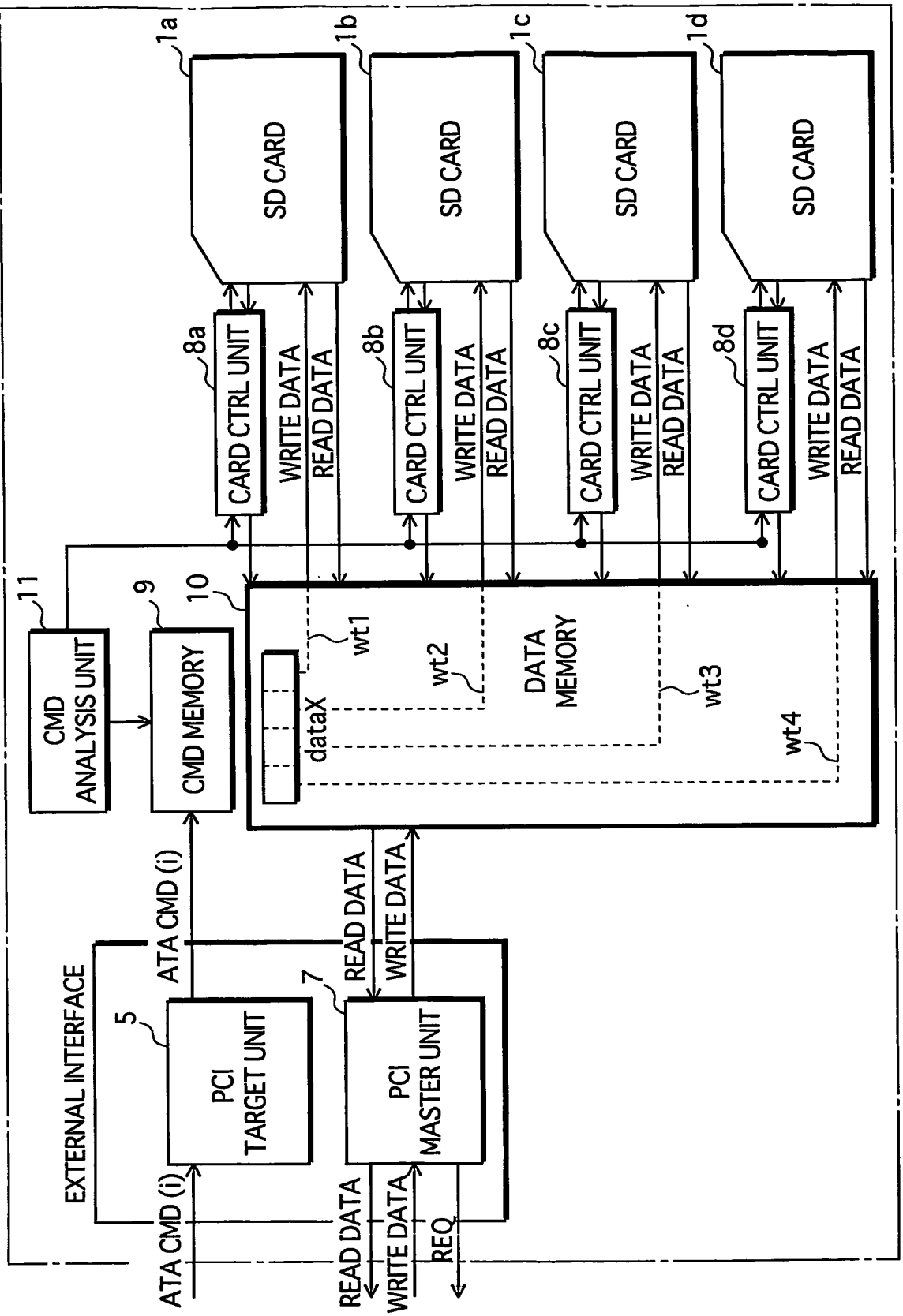

1a
1b
1c
1d
SD CARD
SD CARD
SD CARD
SD CARD
8a
8b
8c
8d
CARD CTRL UNIT
CARD CTRL UNIT
CARD CTRL UNIT
CARD CTRL UNIT
WRITE DATA
READ DATA
WRITE DATA
READ DATA
WRITE DATA
READ DATA
WRITE DATA
READ DATA
11
9
10
CMD ANALYSIS UNIT
CMD MEMORY
wt1
wt2
wt3
wt4
dataX
DATA MEMORY
ATA CMD (i)
READ DATA
WRITE DATA
EXTERNAL INTERFACE
5
7
PCI TARGET UNIT
PCI MASTER UNIT
ATA CMD (i)
READ DATA
WRITE DATA
REQ

FIG.4

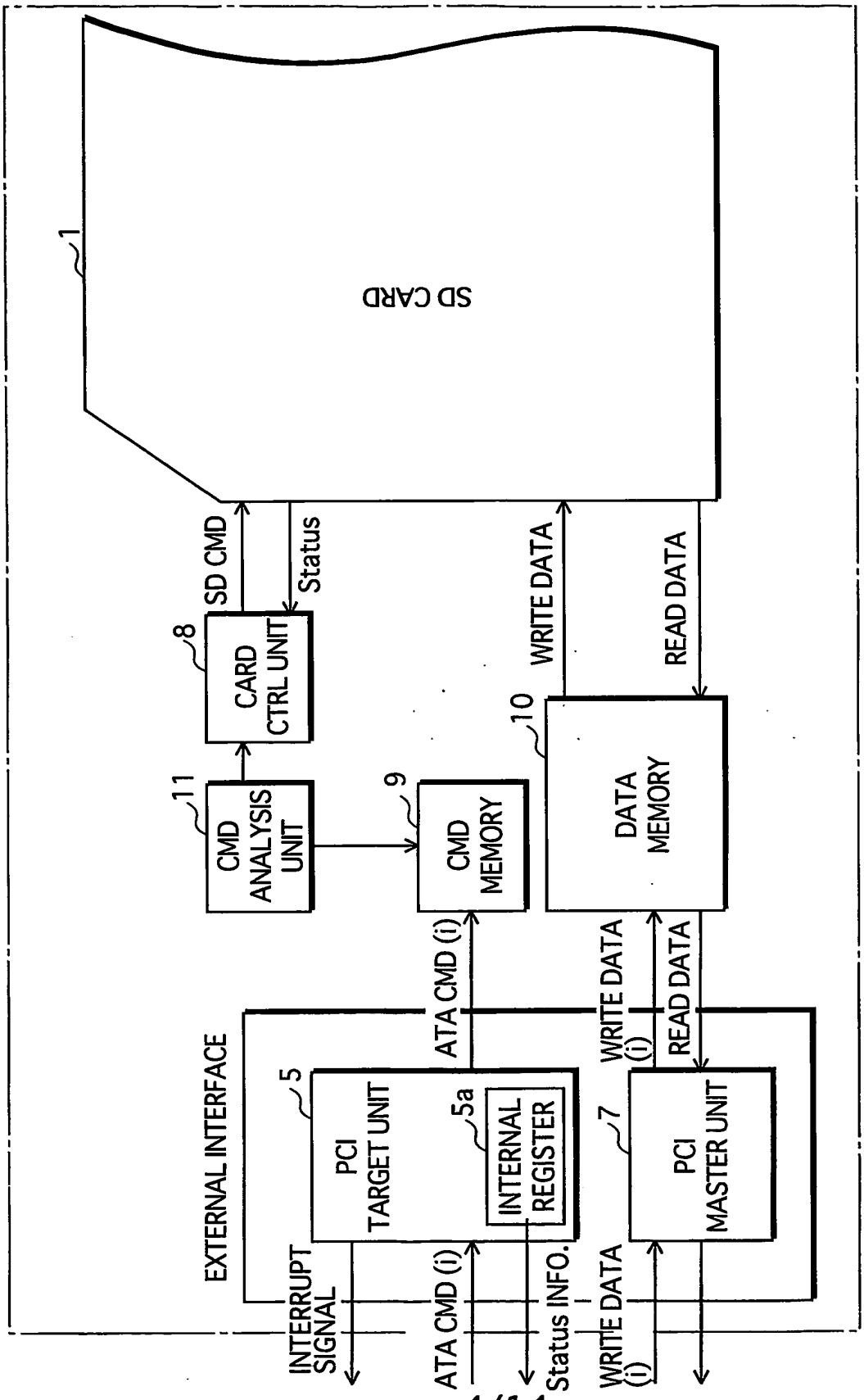

1
SD CARD
SD CMD
Status
8
CARD CTRL UNIT
11
CMD ANALYSIS UNIT
9
CMD MEMORY
10
DATA MEMORY
WRITE DATA
READ DATA
EXTERNAL INTERFACE
5
PCI TARGET UNIT
5a
INTERNAL REGISTER
7
PCI MASTER UNIT
ATA CMD (i)
WRITE DATA (i)
READ DATA
INTERRUPT SIGNAL
ATA CMD (i)
Status INFO.
WRITE DATA (i)

FIG.5

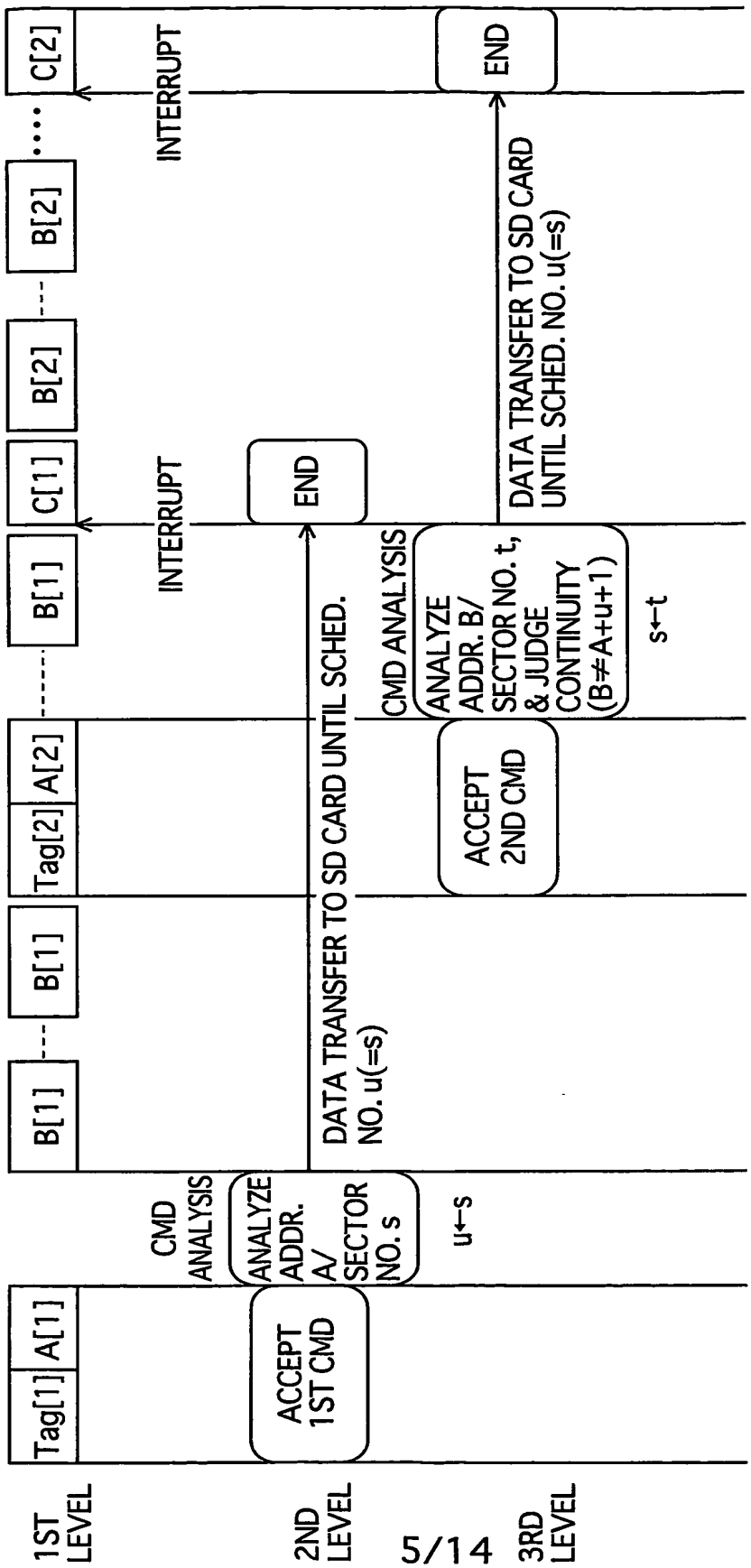

1ST LEVEL
2ND LEVEL
3RD LEVEL
Tag[1]
A[1]
ACCEPT 1ST CMD
CMD ANALYSIS
ANALYZE ADDR. A/ SECTOR NO. s
u←s
B[1]
DATA TRANSFER TO SD CARD UNTIL SCHED. NO. u(=s)
Tag[2]
A[2]
ACCEPT 2ND CMD
CMD ANALYSIS
ANALYZE ADDR. B/ SECTOR NO. t, & JUDGE CONTINUITY (B≠A+u+1)
s←t
INTERRUPT
END
DATA TRANSFER TO SD CARD UNTIL SCHED. NO. u(=s)
C[1]
INTERRUPT
END
C[2]
Tag[1] : TAG SHOWING CONSEC. NO.(=1) OF CMD
A[1] : 1ST CMD ;
B[1] : DATA FOR WRITING BY 1ST CMD ;
C[1] : STATUS INFO. FOR 1ST CMD ;
Tag[2] : TAG SHOWING CONSEC. NO.(=2) OF CMD
A[2] : 2ND CMD ;
B[2] : DATA FOR WRITING BY 2ND CMD ;
C[2] : STATUS INFO. FOR 2ND CMD ;

FIG.6

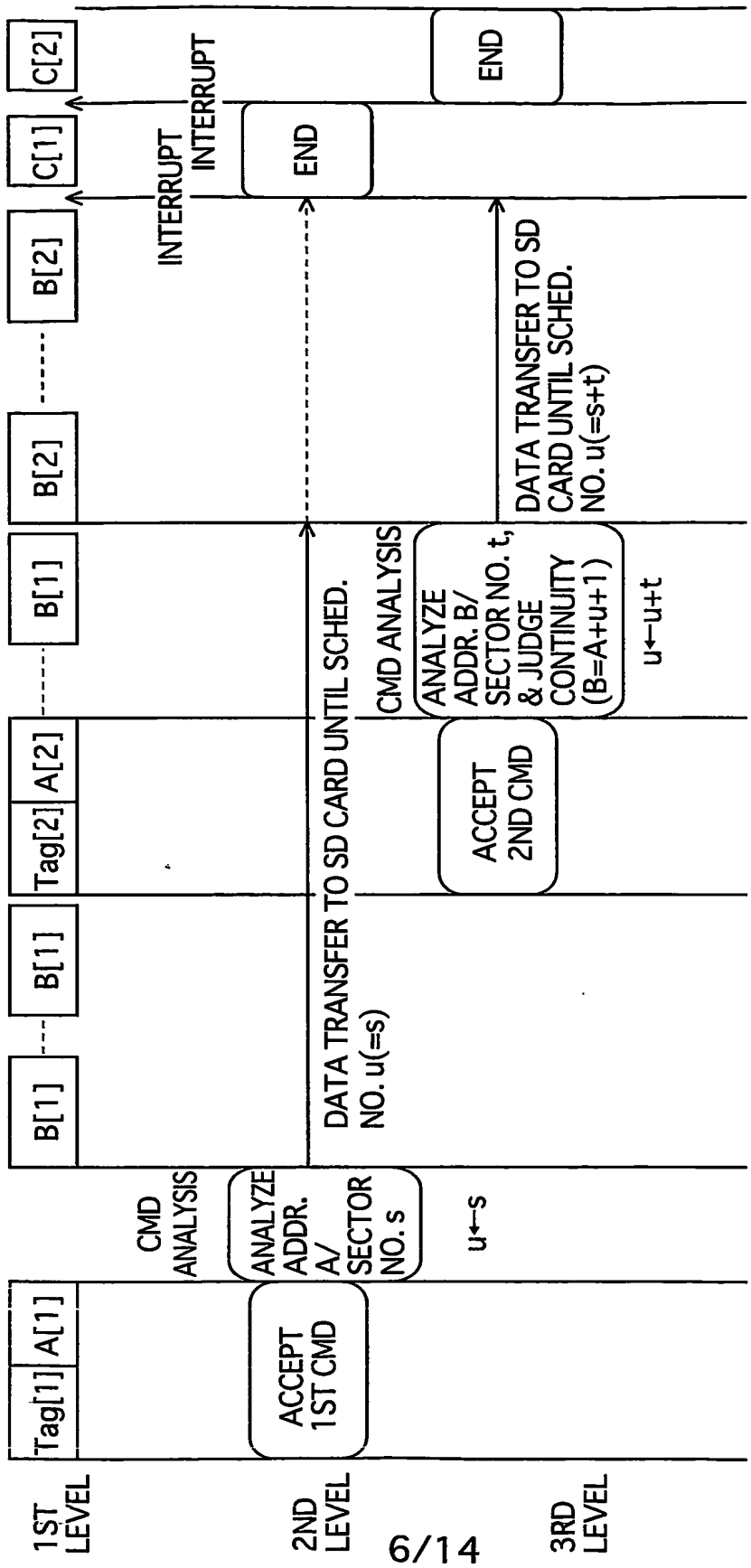

1ST LEVEL
2ND LEVEL
3RD LEVEL
Tag[1]
A[1]
ACCEPT 1ST CMD
CMD ANALYSIS
ANALYZE ADDR. A/ SECTOR NO. s
u←s
B[1]
DATA TRANSFER TO SD CARD UNTIL SCHED. NO. u(=s)
Tag[2]
A[2]
ACCEPT 2ND CMD
CMD ANALYSIS
ANALYZE ADDR. B/ SECTOR NO. t, & JUDGE CONTINUITY (B=A+u+1)
u←u+t
B[1]
B[2]
DATA TRANSFER TO SD CARD UNTIL SCHED. NO. u(=s+t)
INTERRUPT
END
B[2]
INTERRUPT
C[1]
END
C[2]
Tag[1] : TAG SHOWING CONSEC. NO.(=1) OF CMD
A[1] : 1ST CMD ;
B[1] : DATA FOR WRITING BY 1ST CMD ;
C[1] : STATUS INFO. FOR 1ST CMD ;
Tag[2] : TAG SHOWING CONSEC. NO.(=2) OF CMD
A[2] : 2ND CMD ;
B[2] : DATA FOR WRITING BY 2ND CMD ;
C[2] : STATUS INFO. FOR 2ND CMD ;

FIG.7

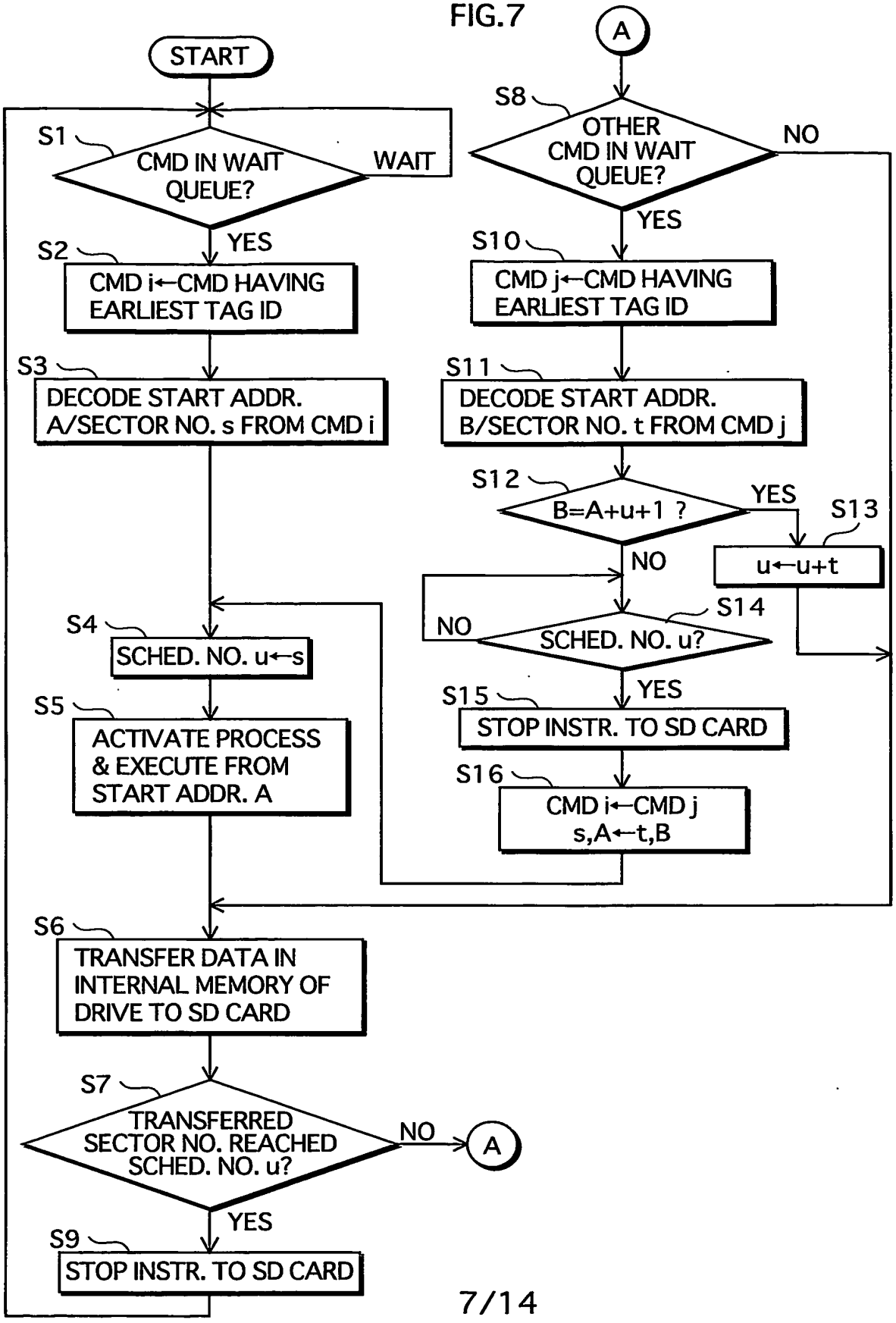
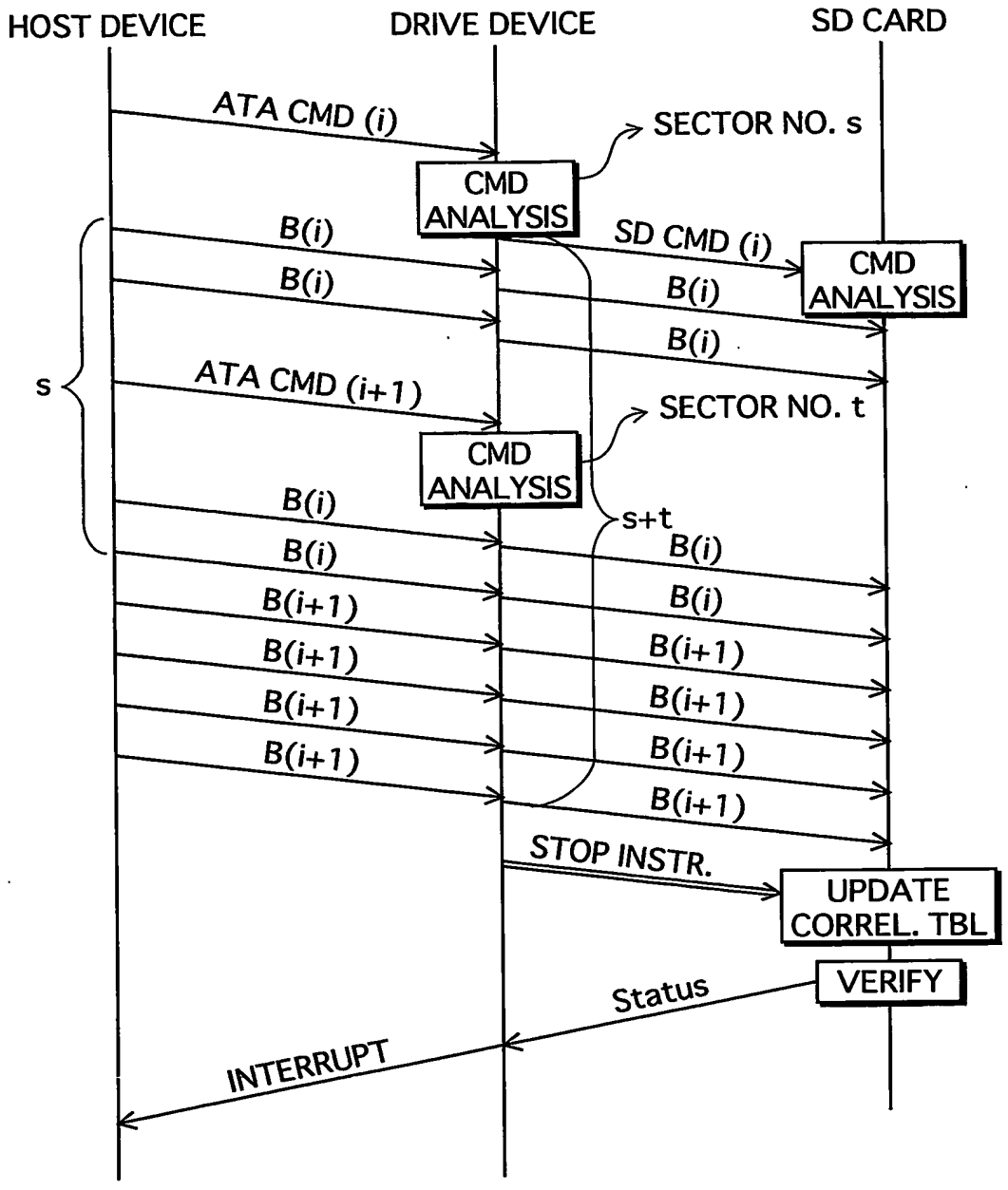

START
S1
CMD IN WAIT QUEUE?
WAIT
YES
S2
CMD i←CMD HAVING EARLIEST TAG ID
S3
DECODE START ADDR. A/SECTOR NO. s FROM CMD i
S4
SCHED. NO. u←s
S5
ACTIVATE PROCESS & EXECUTE FROM START ADDR. A
S6
TRANSFER DATA IN INTERNAL MEMORY OF DRIVE TO SD CARD
S7
TRANSFERRED SECTOR NO. REACHED SCHED. NO. u?
NO
A
YES
S9
STOP INSTR. TO SD CARD
A
S8
OTHER CMD IN WAIT QUEUE?
NO
YES
S10
CMD j←CMD HAVING EARLIEST TAG ID
S11
DECODE START ADDR. B/SECTOR NO. t FROM CMD j
S12
B=A+u+1 ?
YES
S13
u←u+t
NO
S14
NO
SCHED. NO. u?
YES
S15
STOP INSTR. TO SD CARD
S16
CMD i←CMD j
s,A←t,B

FIG.8


HOST DEVICE
DRIVE DEVICE
SD CARD
ATA CMD (i)
SECTOR NO. s
CMD ANALYSIS
B(i)
SD CMD (i)
CMD ANALYSIS
B(i)
B(i)
B(i)
s
ATA CMD (i+1)
SECTOR NO. t
CMD ANALYSIS
s+t
B(i)
B(i)
B(i)
B(i+1)
B(i+1)
B(i+1)
B(i+1)
B(i+1)
B(i+1)
B(i+1)
B(i+1)
STOP INSTR.
UPDATE CORREL. TBL
VERIFY
Status
INTERRUPT

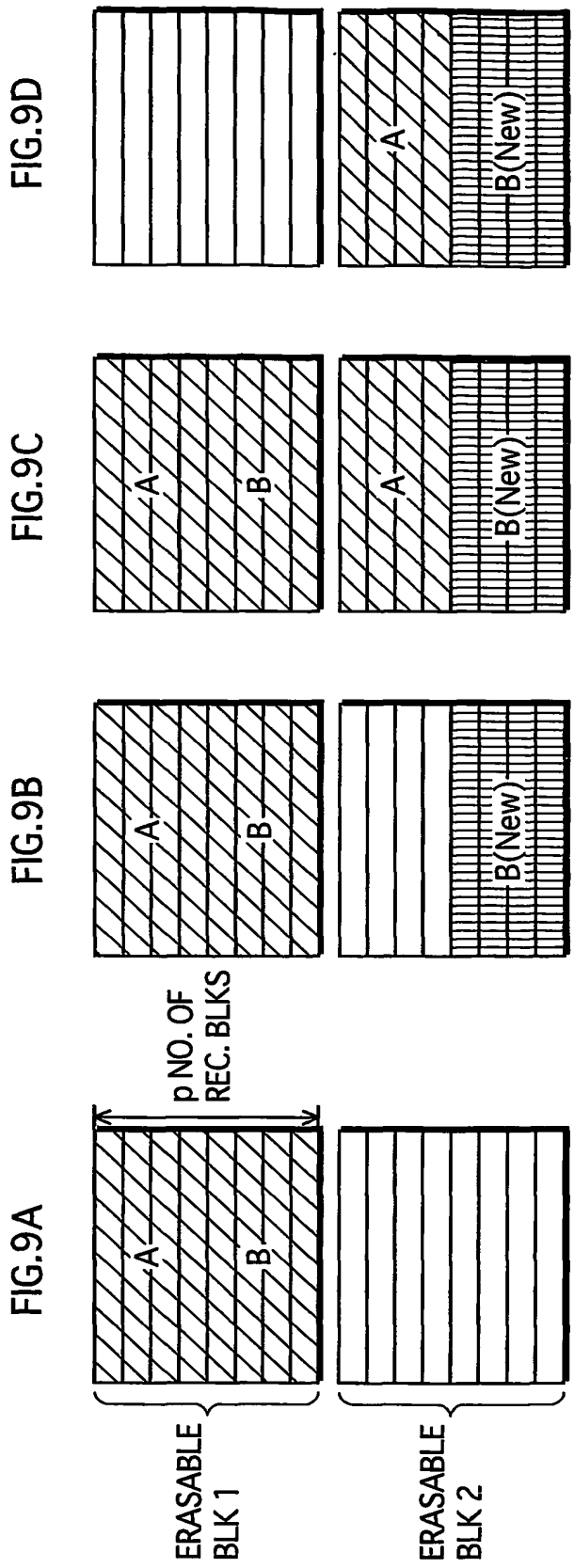


FIG.9A
FIG.9B
FIG.9C
FIG.9D
p NO. OF REC. BLKS
A
B
B(New)
ERASABLE BLK 1
ERASABLE BLK 2

FIG.10

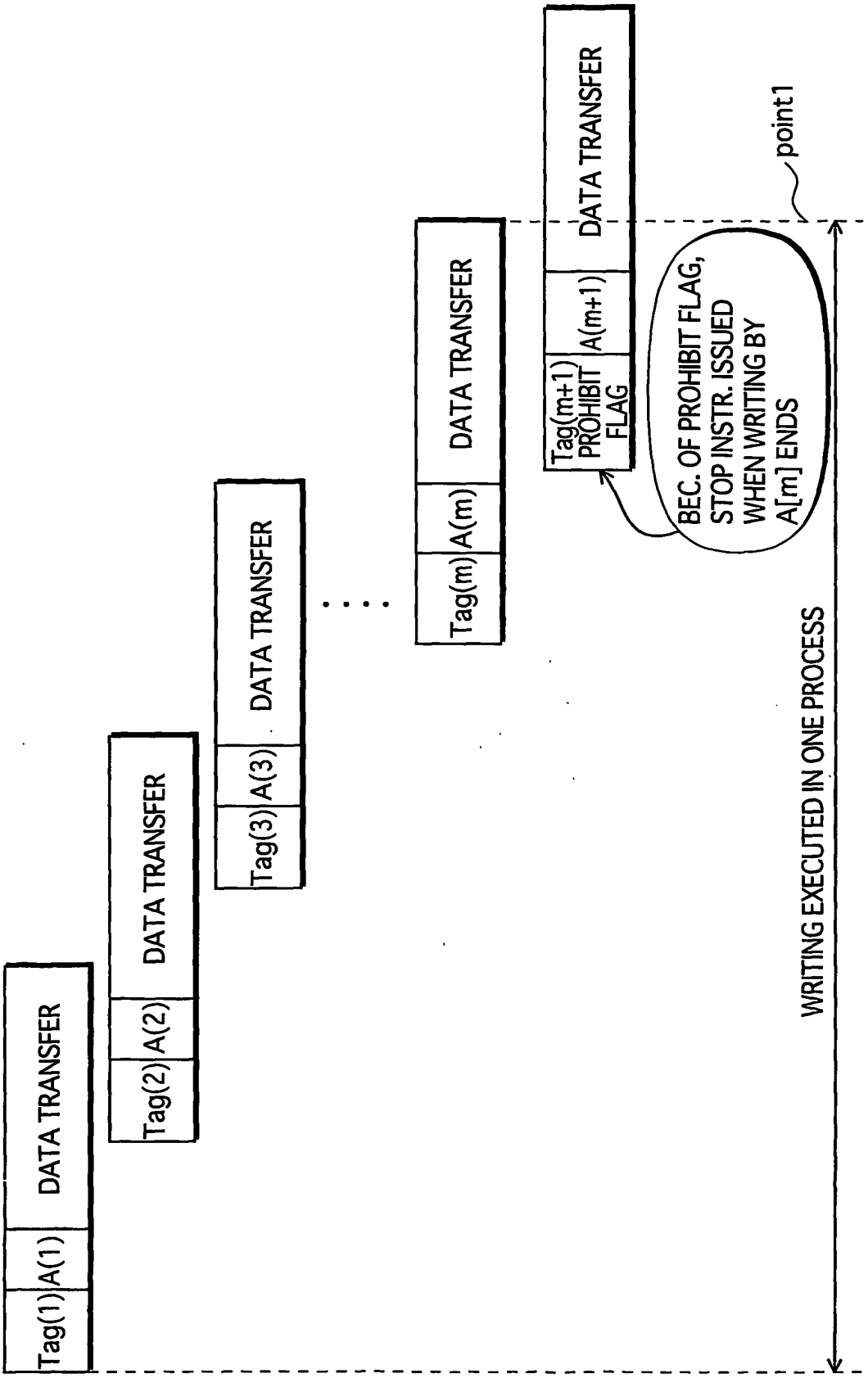

Tag(1)
A(1)
DATA TRANSFER
Tag(2)
A(2)
DATA TRANSFER
Tag(3)
A(3)
DATA TRANSFER
Tag(m)
A(m)
DATA TRANSFER
Tag(m+1)
PROHIBIT FLAG
A(m+1)
DATA TRANSFER
point1
BEC. OF PROHIBIT FLAG, STOP INSTR. ISSUED WHEN WRITING BY A[m] ENDS
WRITING EXECUTED IN ONE PROCESS

FIG.11

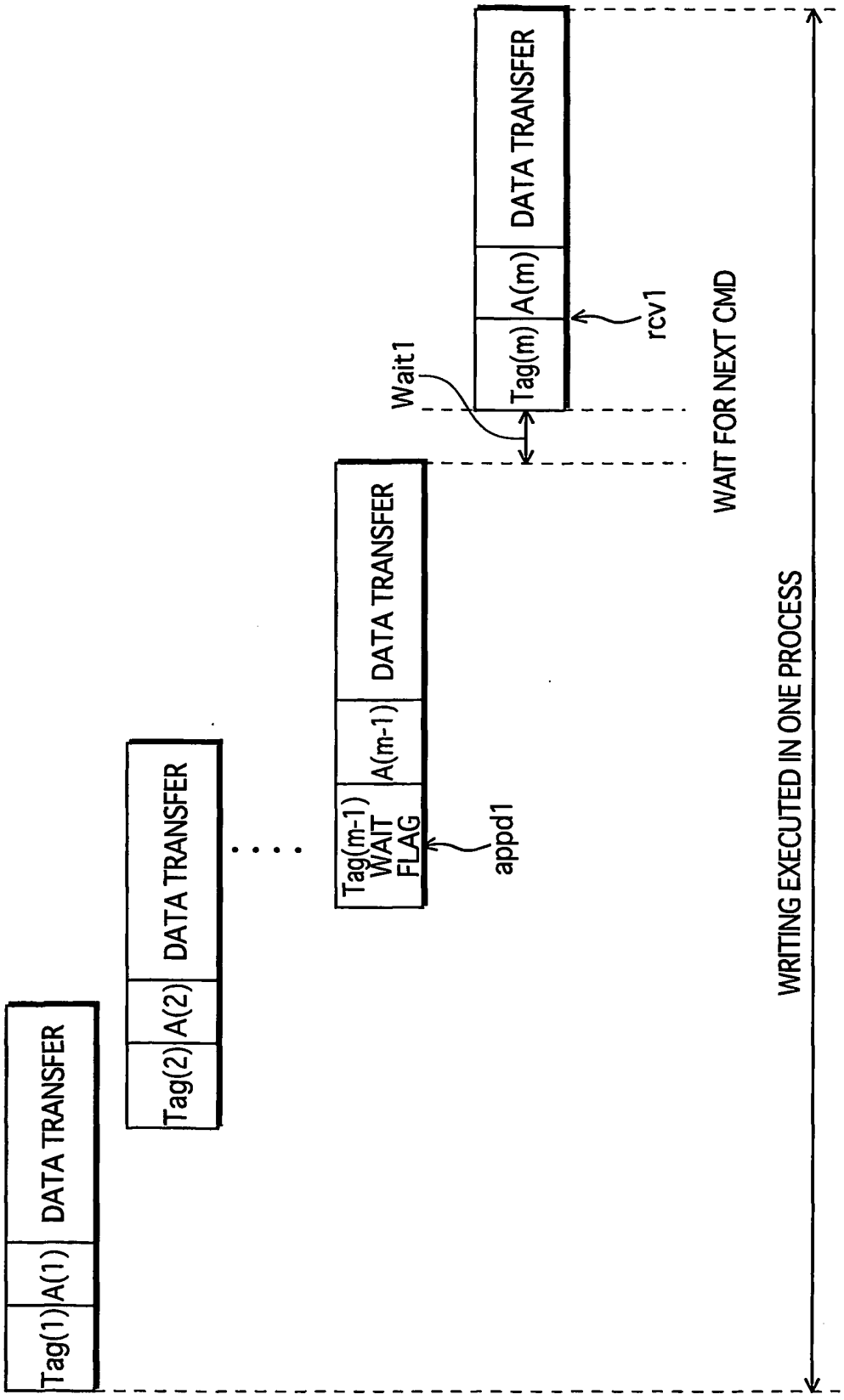

Tag(1)
A(1)
DATA TRANSFER
Tag(2)
A(2)
DATA TRANSFER
Tag(m-1)
WAIT
FLAG
A(m-1)
DATA TRANSFER
appd1
Wait1
Tag(m)
A(m)
DATA TRANSFER
rcv1
WAIT FOR NEXT CMD
WRITING EXECUTED IN ONE PROCESS

FIG.12

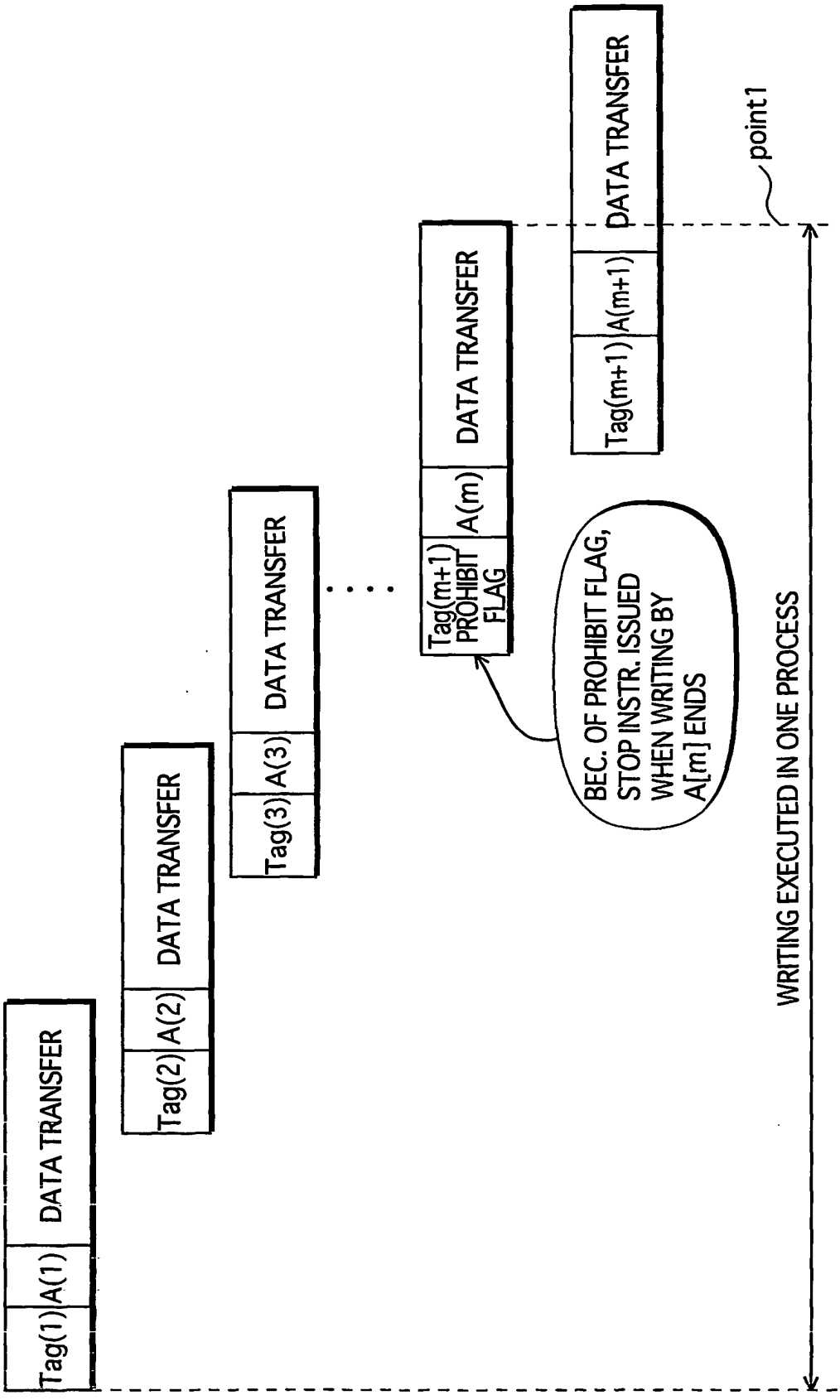

Tag(1)
A(1)
DATA TRANSFER
Tag(2)
A(2)
DATA TRANSFER
Tag(3)
A(3)
DATA TRANSFER
Tag(m+1) PROHIBIT FLAG
A(m)
DATA TRANSFER
Tag(m+1)
A(m+1)
DATA TRANSFER
point1
BEC. OF PROHIBIT FLAG, STOP INSTR. ISSUED WHEN WRITING BY A[m] ENDS
WRITING EXECUTED IN ONE PROCESS

FIG.13

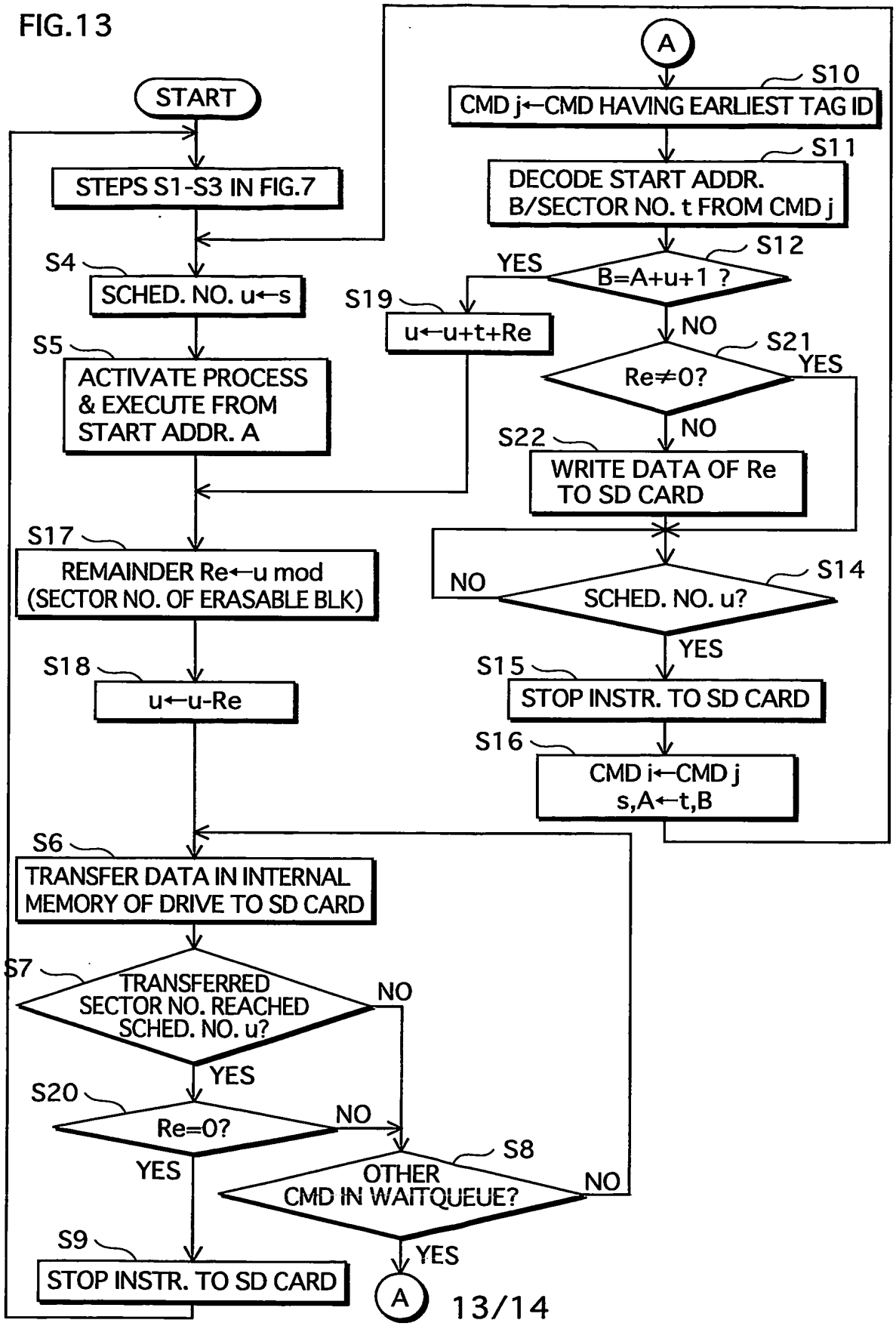

START
STEPS S1-S3 IN FIG.7
S4
SCHED. NO. u←s
S5
ACTIVATE PROCESS & EXECUTE FROM START ADDR. A
S17
REMAINDER Re←u mod (SECTOR NO. OF ERASABLE BLK)
S18
u←u-Re
S6
TRANSFER DATA IN INTERNAL MEMORY OF DRIVE TO SD CARD
S7
TRANSFERRED SECTOR NO. REACHED SCHED. NO. u?
NO
YES
S20
Re=0?
NO
YES
S8
OTHER CMD IN WAITQUEUE?
NO
YES
S9
STOP INSTR. TO SD CARD
A
A
S10
CMD j←CMD HAVING EARLIEST TAG ID
S11
DECODE START ADDR. B/SECTOR NO. t FROM CMD j
S12
B=A+u+1 ?
YES
S19
u←u+t+Re
NO
S21
Re≠0?
YES
NO
S22
WRITE DATA OF Re TO SD CARD
S14
SCHED. NO. u?
NO
YES
S15
STOP INSTR. TO SD CARD
S16
CMD i←CMD j
s,A←t,B

FIG.14A

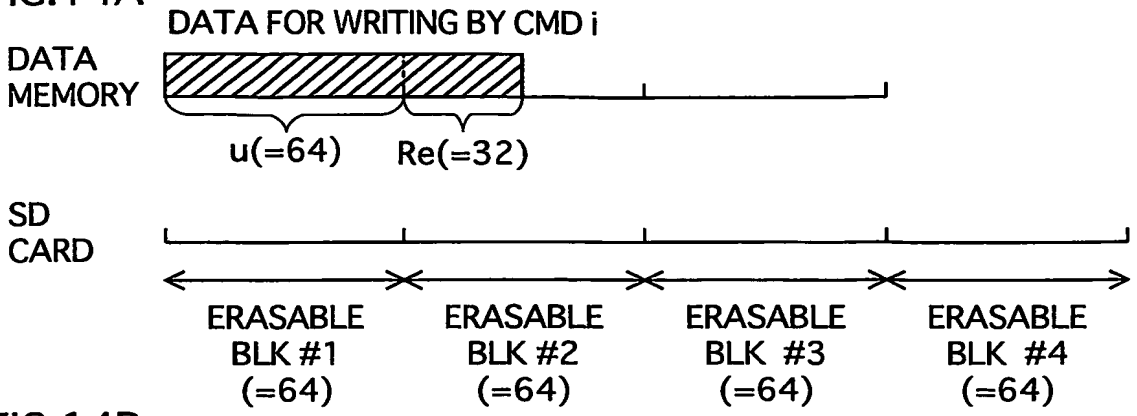


FIG.14B

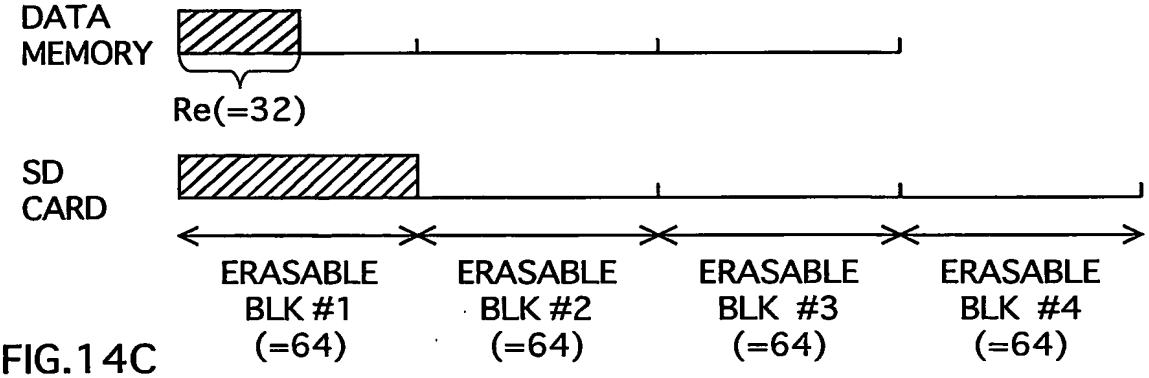


FIG.14C

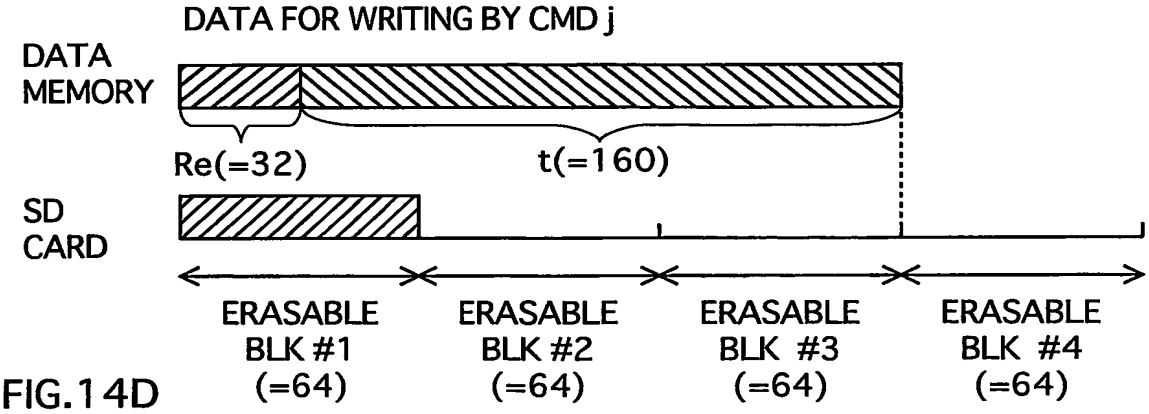
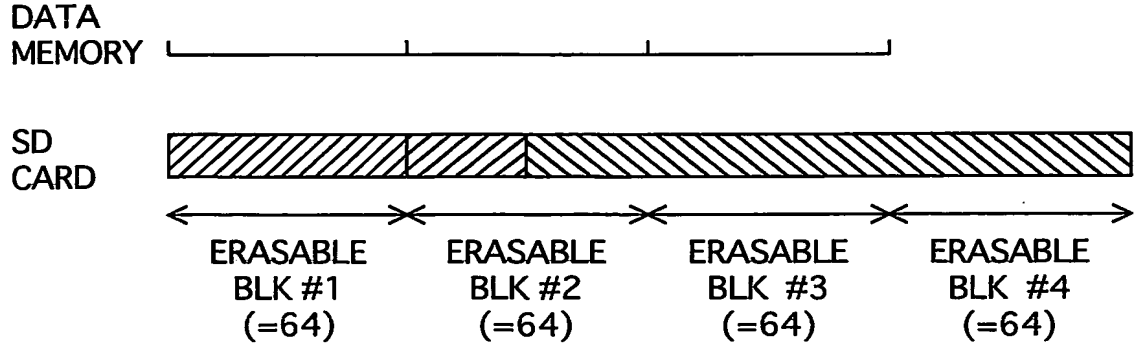



FIG.14D